REMARKS

1. Objections Based on Informalities

Dependent claims 2-22, 24-44, 46-66 and 68-85 are objected to for beginning with the letter "A." Claims 24, 46 and 68 have been canceled. All remaining dependent claims currently in the application have either been amended or newly written to begin with "The" and thus this objection should be obviated.

2. Claims Rejections

Claims 1-14, 22-36, 44-58, 66-79, 81-83 and 85 are rejected as either anticipated by Kim US2003/0086507A1 or obvious in view of Kim combined with the knowledge of a person skilled in the art and/or Busson US2003/0053562A1.

The Applicant respectfully submits that the claims as amended clearly distinguish over the cited references. All rejected independent claims have been amended to recite either an apparatus or method for generating an excursion signal corresponding to an excursion event wherein the excursion event is comprised of a plurality of signal samples having magnitudes outside a defined signal parameter. The independent claims are further amended to include an excursion signal scaling system, a filter system and a delay element. Neither of the cited references describes an apparatus or method as presently claimed nor would the presently-claimed apparatus and method have been obvious to a person of ordinary skill in the art.

In para 0027, Kim states that "peak search detector 110 determines the location and magnitude of the found the (sic) peak(s)." A scaling process is then applied to a peak as described in para 0029 to generate a "threshold correction signal" which is required "to reduce the highest peak found within the window to the

predetermined threshold value or, alternatively, below the predetermined threshold value." Kim's equation in para 0038 defines the overall operation as subtraction of the scaled and time-aligned filter impulse response from the delayed signal. This description neither anticipates nor renders obvious the presently-amended claims. In para 0038, Kim alludes to the possibility of repeating the described peak-limiting process. Kim states that "several iterations of the peak location and peak clipping may be performed by peak limiting architecture 100." However, the observation by Kim that many iterations of the described processing are required to obtain fine control over the value of signal peaks reflects a basic limitation in the concept itself. Moreover, the amount of in-band noise generated by Kim's approach in reducing signal peaks is much larger than theory indicates should be achievable.

The most critical limitation of the approach described by Kim is that it is constrained to subtract from the original signal only a scaled version of a fixed pulse shape, i.e., the impulse response of Kim's clipping filter 125. Repeated iterations of this basic operation will ensure that any portion of the signal whose magnitude extends beyond any defined threshold can be brought back equal to or less than that threshold. However, those repeated iterations each add a great deal of oscillatory "noise" around the main lobe of the filter impulse response. Since international standards for wireless signaling constrain the maximum amount of such noise that may be added to any transmitted signal, these standards-based limits prevent the approach described by Kim from achieving performance close to the theoretical limits for peak reduction.

The approach described and claimed in the present application represents a significant advance over approaches such as Kim's by defining an "excursion" event

as consisting of multiple signal samples whose magnitude exceeds the threshold, and scaling and filtering this entire excursion event prior to subtracting it from the original signal. The Applicant respectfully submits that Kim's processing approach cannot be described in terms of excursions. Kim's description of a "window" of samples in which a peak is found for an excursion event is not a description of peak reduction processing on an entire excursion event basis. Kim is unambiguous in defining the processing involved in the described technique. In para 0026, Kim states that "the peak search detector 110 searches for the highest peak within the window of samples." In para 0027, Kim states that the "peak search detector 110 determines the location and magnitude of the found the (sic) peaks." In para 0028, Kim states that the "clipping factor calculator 115 calculates the appropriate fraction necessary to reduce the found peak to the pre-determined threshold level." In para 0029, Kim describes forming the product of that factor and the peak sample found by peak search detector 110, and that the product complex value "is then fed into a clipping filter" which generates a threshold-correcting signal. Finally, in para 0030, Kim states that the output Z(n) is formed by summing the delayed original signal and the threshold-correcting signal. Note that Kim's definition of clipping factor ensures that this will always be mathematically equivalent to subtracting the scaled filter impulse response from the delayed original signal. The specificity in Kim's description makes it clear that the described approach can only reduce signal peaks by iteratively subtracting scaled versions of the filter impulse response. The approach described by Kim thus suffers the infirmities discussed above.

By way of illustration, Figures 1 and 2 below depict an example wherein a set of signal samples exceed a defined threshold.

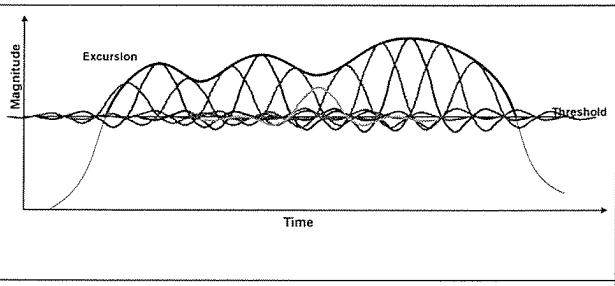


Figure 1. Iterative Approach

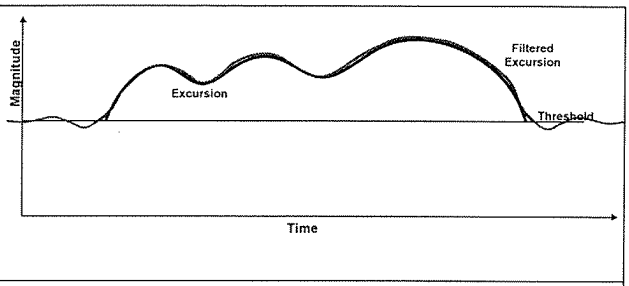


Figure 2. Entire Excursion Approach

Figure 1 depicts peak reduction using three iterations of the Kim-type approach; subtracting all the scaled pulse shapes yields a signal whose peak across this interval does not exceed the threshold. However, the aggregate noise contributed by the many oscillatory extensions of the scaled pulses contributes far too much noise. The technique of the current application as illustrated in Figure 2 minimizes this aggregate noise by entirely avoiding the iterative approach described by Kim.

It is critical to appreciate that the oscillatory pre-cursor and post-cursor behavior discussed above is fundamental to any filtered signal. The spectral constraints imposed by any of the worldwide wireless standards cannot be satisfied without filtering the signal and any peak-reduction waveforms. The goal of the research leading to the current patent application was to minimize the aggregate amount of noise contributed by oscillatory extensions by altering the input to the filter – specifically by defining the filter input to consist of many complex samples, i.e., more than the single complex sample/impulse of the Kim approach.

Two issues addressed by the present application include: 1) proper definition of an excursion; and, 2) proper scaling of the excursion samples. These two

issues interact in a complex manner, and are greatly compounded by the fact that multiple peaks can occur within what is defined as an excursion, i.e., a contiguous set of signal samples whose magnitude exceeds the threshold.

In the work underlying the current application, research showed that it is possible to achieve substantial performance improvements over the iterative approach as described by Kim by defining an excursion consisting of as few as three signal samples centered about each individual signal peak, with the scale factor assigned to each such sample set relative to the sample magnitudes. This approach is superior to prior peak-reduction processing approaches, and is distinct from, and superior to, the peak-reduction algorithms described in Kim. The scaling approaches described in the present application were all shown to substantially outperform the iterative approach as described by Kim, and this performance benefit is directly attributable to the Applicant's recognition of the need to base both the excursion definition and excursion scaling on signal points adjacent to the actual signal peak.

The scaling and filtering limitations added to each of the currently-amended independent claims further distinguishes the claims from the description and approach of Kim. Kim's approach involves a single complex impulse for a multi-sample excursion. Kim selects a single sample per signal peak, scales that single complex sample based only on its relationship to the magnitude threshold, then subtracts the resulting 'threshold-correcting signal' (i.e., the scaled pulse shape generated by passing this scaled impulse through a filter) from the time-aligned original signal samples. Conversely, the "excursion" recited in the present claims is a multi-sample segment rather than the single highest-peak sample value, and the scaling recited in the present

claims is a function of substantially all excursion sample values within a multi-sample segment; but, as discussed, the excursion may be represented by as few as three signal sample values and still offer substantial performance advantages over the approach of Kim.

In summary, the Kim reference does not describe the scaling and filtering of an entire set of samples whose magnitude exceeds a threshold (an excursion event) prior to subtracting the excursion event from the original signal. Neither Busson nor the knowledge of an ordinary person skilled in the art supply the aspect missing from Kim vis-à-vis the currently amended claims. Claims 1-23, 25-45, 47-67 and 69-85 should therefore be allowable as amended.

3. Allowable Subject Matter

Claims 15-21, 37-43, 59-65, 80 and 84 have been indicated allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

New claims 86-108 have been added as rewritten forms of claims 15-21, 37-43, 59-65, 80 and 84, respectively. Claims 86-108 are therefore directed to allowable subject matter and should thus be allowed.

CONCLUSION

Based on the foregoing amendments and remarks, the Applicant respectfully submits that the claims as currently presented are patentable and in condition for allowance.

If any issues remain, or if the Examiner has any suggestions for expediting issuance of this application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

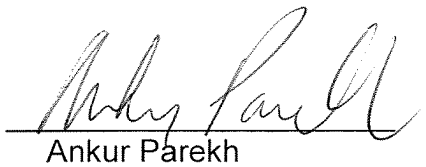
Favorable consideration is respectfully requested.

AUTHORIZATION

The Commissioner is hereby authorized to charge any additional fees that may be required for this amendment, or credit any overpayment to Deposit Account No. 13-4500, Order No. 4821-4003.

Respectfully submitted,

Dated: January 17, 2007

By: 
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